Name_____ Class_____ Date_____

LESSON

9.3 The Outer Planets

As you are reading section 9.3 complete the reading guide below.

From the sun, what is the order of the **outer** planets?

Jupiter Saturn Uranus Neptune

1. Hydrogen, helium, and methane are gases on Earth. Why are these substances liquids on the gas giants?

Gases change to liquids at high pressure + low temperatures which exist on the outer planets.

Identify

2. Underline what makes up each of Jupiter's three distinct layers.

Jupiter's Structure

Overall, Jupiter is about 80 percent hydrogen and 20 percent helium with small amounts of other materials. The planet is a ball of gas swirling around a thick liquid layer that conceals a solid core. About 1,000 km below the outer edge of the cloud layer, the pressure is so great that the hydrogen gas changes to liquid. This thick layer of liquid hydrogen surrounds Jupiter's core. Scientists do not know for sure what makes up the core. They suspect that the core is made of rock and iron. The core might be as large as Earth and could be 10 times more massive.

3. In the passage below, *circle the number of moons that Jupiter has* according to your textbook. Because we are always discovering new things about our solar system, that number has recently changed. Scan the QR code to find out how many moons we currently think Jupiter has, and *correct the number below.*

The Moons of Jupiter

79!

Jupiter has at least 67 confirmed moons. In 1610 the astronomer Galileo Galilei was the first person to see Jupiter's four largest moons. *The four largest moons of Jupiter—Io, Europa, Ganymede, and Callisto—are known as the* **Galilean moons**. The Galilean moons, described in **Table 1**, orbit around Jupiter while keeping the same face towards the giant gas planet, just like the Moon orbits with the same face towards Earth.

According to that same website, name a characteristic that is unique to each of the Galilean moons:

layered structure

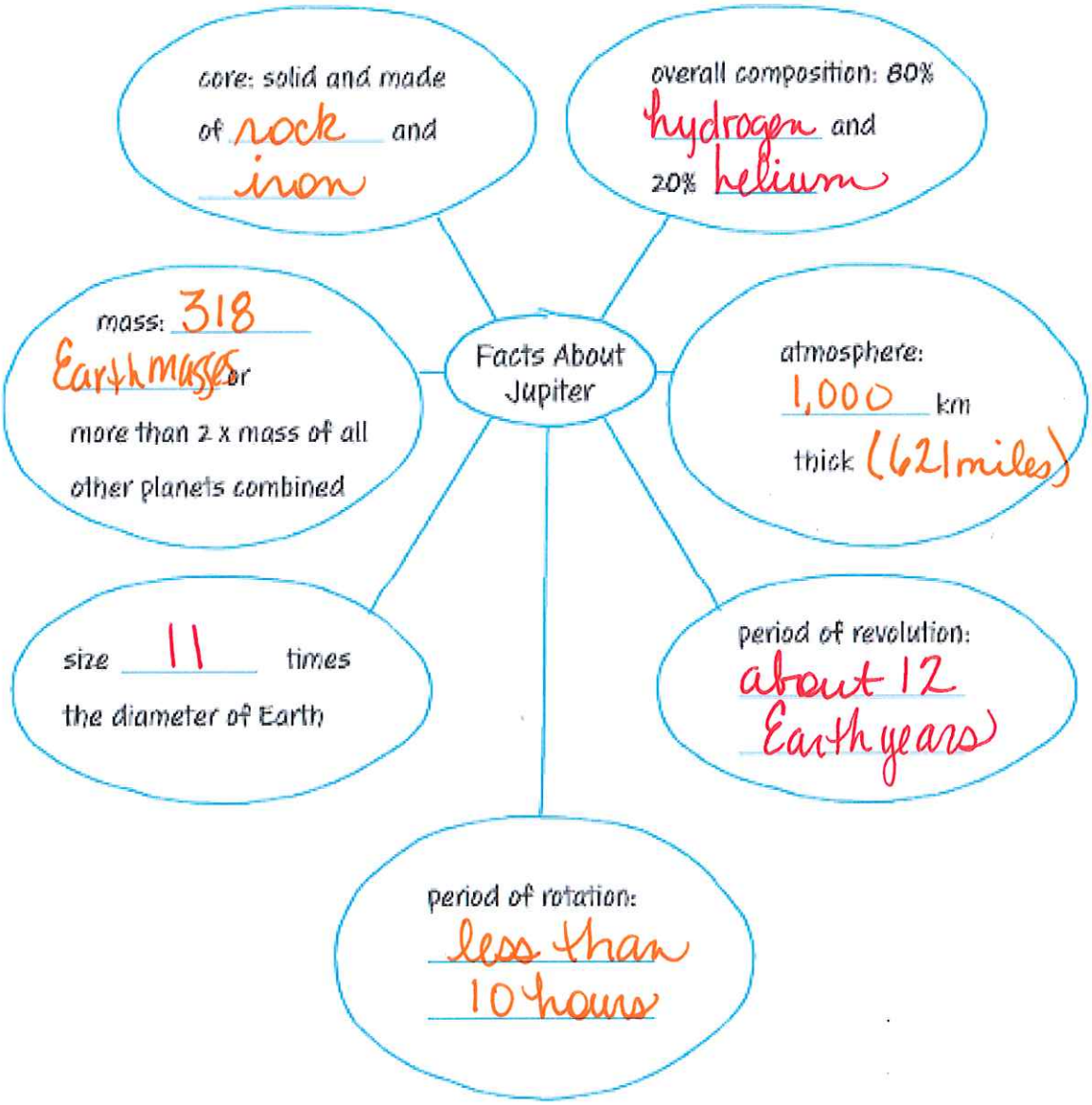
Io most volcanically active body in the solar system

Europa mostly water ice; twice as much water as Earth

Ganymede largest moon in the solar system & has its own magnetic field

Callisto extremely cratered; less defined layers; mixture of ice & rock

Describe Jupiter by completing the spider map. TEKS 6.11(A)



Identify

3. Circle what makes up Saturn and its ring system.

Saturn's Structure

Saturn is made mostly of hydrogen and helium with small amounts of other materials. As shown in **Figure 3**, Saturn's structure is similar to Jupiter's structure—an outer gas layer, a thick layer of liquid hydrogen, and a solid core.

The ring system around Saturn is the largest and most complex in the solar system. Saturn has seven bands of rings, each containing thousands of narrower ringlets. The main ring system is over 70,000 km wide, but it is likely less than 1 km thick. The ice particles in the rings are possibly from a moon that was shattered in a collision with another icy object.

Word Origin

probe from Medieval Latin *proba*, means "examination"

Describe

4. Provide three ways in which the outer planets are similar.

- composed of hydrogen + helium
- Strong gravitational forces
- Layers of thick gas, liquid, + small core

Math Skills Math TEKS 6.1(A), 6.1(B), 6.3(E), 6.4(E)

Ratios

A ratio is a quotient—it is one quantity divided by another. Ratios can be used to compare distances. For example, Jupiter is 5.20 AU from the Sun, and Neptune is 30.05 from the Sun. Divide the larger distance by the smaller distance:

$$\frac{30.05\ \text{AU}}{5.20\ \text{AU}} = 5.78$$

Neptune is 5.78 times farther from the Sun than Jupiter.

Practice

How many times farther from the Sun is Uranus (distance = 19.20 AU) than Saturn (distance = 9.58 AU)?

$\frac{19.2\text{AU}}{9.58\text{AU}} =$ 2 times as far

Go Online! Check Tutor

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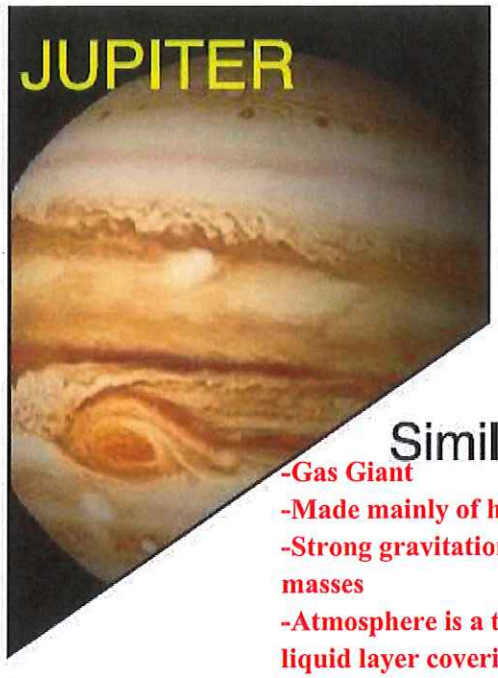
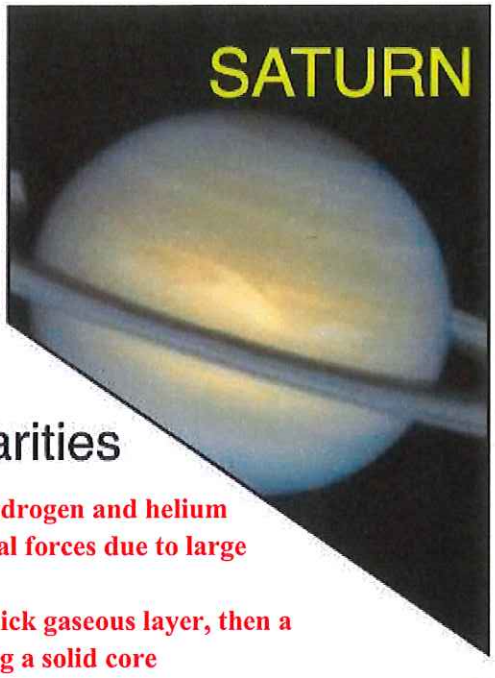
Outer Planets Comparisons

Write the similarities of the outer planets in the center section. In the margins, you should write characteristics that are unique only to that planet.

-5th planet from sun
-Largest planet in our solar system
-Over twice the mass of all other planets combined
-Rotates fastest on its axis (shortest day)
-12 year revolution
-Great Red Spot is a hurricane-like storm of swirling gases
-Galilean Moons



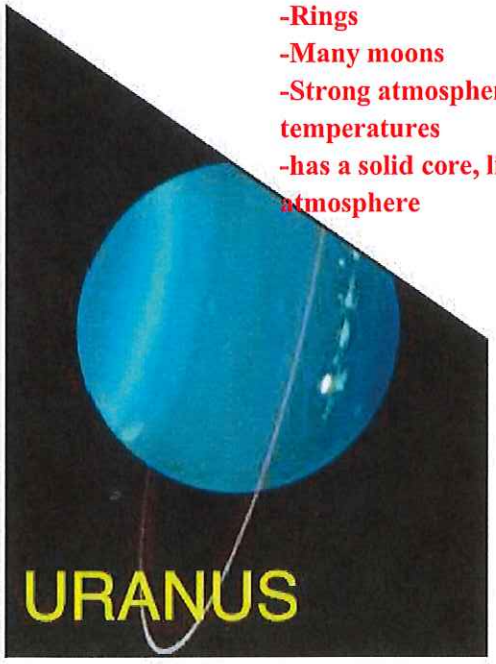


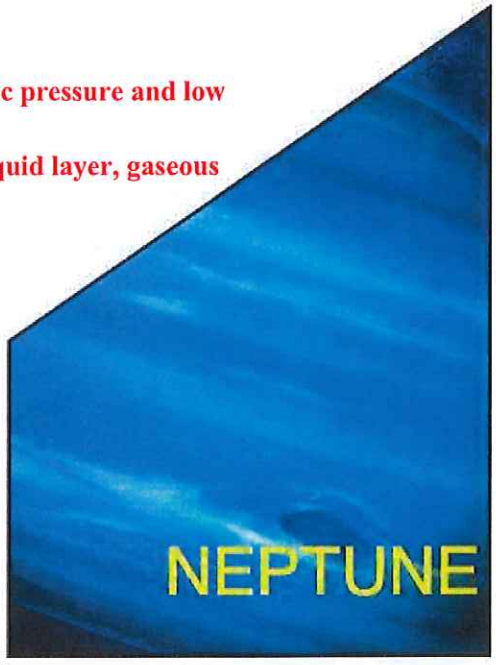
-2nd largest planet
-Least dense-could float in water
-Largest ring system
-About a 30 year revolution
-6th planet from the sun

Similarities

-Gas Giant
-Made mainly of hydrogen and helium
-Strong gravitational forces due to large masses
-Atmosphere is a thick gaseous layer, then a liquid layer covering a solid core
-Rings
-Many moons
-Strong atmospheric pressure and low temperatures
-has a solid core, liquid layer, gaseous atmosphere

-3rd largest planet
-7th planet from sun
-Methane in atmosphere gives it its blue color
-98 degree tilted axis of rotation (rotates top to bottom)
-About an 84 year revolution





-4th largest planet
-Farthest known planet from the sun
-Methane in atmosphere causes blue color
-About 165 years of revolution
-Big dark blue spot that is similar to a hurricane